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EXAMINER	
RUGGLES, JOHN S	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 09/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/649,310	LIN, CHENG-MING	
	Examiner	Art Unit	
	John Ruggles	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 August 2006 and 14 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *40-50 and 53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *40-50 and 53* is/are rejected.

7)☒ Claim(s) *40-50 and 53* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/14/06 has been entered.

Response to Amendment

In the currently entered submission filed on 7/14/06, claims 1-39 remain as previously cancelled, claims 40, 42-50, and 53 are currently amended, claims 51-52 and 54-67 are now cancelled, and claim 41 remains as previously presented. Therefore, only claims 40-50 and 53 remain under consideration.

The previous objection to the title of the invention is withdrawn in view of Applicant's currently entered 7/14/06 amendment.

The previous specific objections to the specification numbered (6), (7), and (9) are withdrawn in view of current amendments to the specification. However, the previous objection numbered (8) was not addressed by Applicant and has been maintained along with further objection(s) not specifically exemplified previously, as listed below.

The previous objection of claim 51 as being a substantial duplicate of claim 50 is withdrawn in view of the currently entered amendment filed on 7/14/06 canceling claim 51. However, this currently entered amendment has also necessitated further objections as indicated below.

Some of the previous rejections of claims under the first and second paragraphs of 35 U.S.C. 112 are withdrawn in view of the currently entered amendment and accompanying remarks (see the previous Office action mailed on 7/28/06, especially item 5 elements (3)-(5), for a list of specific rejections under this section that are overcome by this amendment). However, this currently entered amendment has failed to address other previous rejections under this section (as indicated by the previous 7/28/06 Office action item 11) and has also necessitated a new rejection under the second paragraph of 35 U.S.C. 112, both of which are set forth below.

The previous art rejections of claims 40-67 under 35 USC 103 are withdrawn in view of the currently entered amendment and accompanying remarks. However, this currently entered amendment has necessitated new art rejections under 35 USC 103, as described below.

Applicant's arguments with respect to claims 40-50 and 53, as currently amended, have been considered but are moot in view of the new ground(s) of rejection set forth below, which are necessitated by Applicant's currently entered amendment.

Specification

The previous objection to the title of the invention is withdrawn in view of Applicant's currently entered 7/14/06 amendment.

The previous specific objections to the specification numbered (6), (7), and (9) are withdrawn in view of current amendments to the specification. However, the previous objection numbered (8) was not addressed by Applicant and has been maintained along with further objection(s) not specifically exemplified previously, as listed below.

The disclosure is still objected to at least because of the following exemplary informalities: (8) in [0031] line 5, "fabricator" should be clarified to --mask fabricator--, along

with similar changes throughout the specification and (10) in [0028] line 22, "T_t = transmittance through line-A relative to light through line-B based on" should be corrected to --T_t = transmittance through line-A (T_1) ~~relative to light~~ divided by transmittance through line-B (T_2), based on--, in order to be consistent with the expression "$T_t = T_1/T_2$" found in [0028] line 14.

Appropriate correction is required.

Claim Objections

The previous objection of claim 51 as being a substantial duplicate of claim 50 is withdrawn in view of the currently entered amendment filed on 7/14/06 canceling claim 51. However, this currently entered amendment has also necessitated further objections as indicated below.

Claims 40-50 and 53 are objected to because of the following informalities: (1) in claim 40 line 10, "etch stopping at" should be changed to --[[etch]] stopping the etching of clear areas at-- and (2) this same change should also be made in claim 53 line 10. Claims 41-50 depend on claim 40. Appropriate correction is required.

Claim Rejections - 35 USC § 112

Some of the previous rejections of claims under the first and second paragraphs of 35 U.S.C. 112 are withdrawn in view of the currently entered amendment and accompanying remarks (see the previous Office action mailed on 7/28/06, especially item 5 elements (3)-(5), for a list of specific rejections under this section that are overcome by this amendment). However, this currently entered amendment has failed to address other previous rejections under this section (as indicated by the previous 7/28/06 Office action item 11) and has also necessitated a new rejection under the second paragraph of 35 U.S.C. 112, both of which are set forth below.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 41 and 53 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a first wavelength (λ_0) of 193nm and a second wavelength (λ_t) of 157nm ($\lambda_0 - \lambda_t = 36$nm, e.g., at [0021] lines 6-9, etc.), does not reasonably provide enablement for the full scope of **λ_t being *at least 30nm* smaller than λ_0** ($\lambda_0 - \lambda_t \geq 30$nm, as required by claims 41 and 53). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make or use the invention commensurate with the full scope of these claims. These claims also fail to comply with the written description requirement. The claim(s) contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

While Applicant states on page 14 of the currently entered amendment that support for the relationship $\lambda_0 - \lambda_t \geq 30$nm comes from the equations in [0028], this assertion is not found to be persuasive because the only relationship of λ_0 to λ_t in [0028] is in the definition of Φ_t, where "$\lambda_t < \lambda_0$". Therefore, Applicant must remove this new matter in claims 41 and 53. However, for the purpose of this Office action and in order to advance the prosecution of this application, "wherein the second wavelength is at least 30nm smaller than the first wavelength" in claim 41 lines 1-2 and claim 53 lines 18-19 is interpreted in accordance with the example at [0021] lines 6-9 to mean --wherein the second wavelength is ~~at least 30nm smaller than~~ 157nm and the first wavelength is 193nm--.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 40-50 and 53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 40 line 10, "the transparent so that" is confusing and should be corrected to --the transparent layer so that--, in accordance with the antecedent basis for "transparent layer" found in claim 40 line 6. Claims 41-50 depend on claim 40.

Also, in each of claim 42 lines 23-25 and claim 53 lines 49-51, the description "T_t is the second predetermined transmittance of light at λ_t through the dark areas relative to light at λ_1 through the clear areas" (in claim 42, noting the incorrect subscript of λ as being "1" instead of --[[1]] t--) and "T_t is the second predetermined transmittance of light at λ_t through the dark areas relative to light at λ_t through the clear areas" (in claim 53) do not correspond to the previous expression given as $T_t = T_1/T_2$ in each of claim 42 line 10 and claim 53 line 35, respectively. However, for the purpose of this Office action, each of these claims has been interpreted in accordance with the expression $T_t = T_1/T_2$ to mean that --T_t is the ~~second predetermined~~ first transmittance of light (T_1) at λ_t through the dark areas ~~relative to~~ divided by the second transmittance of light (T_2) at λ_t through the clear areas--.

Claim Rejections - 35 USC § 103

The previous art rejections of claims 40-67 under 35 USC 103 are withdrawn in view of the currently entered amendment and accompanying remarks. However, this currently entered amendment has necessitated new art rejections under 35 USC 103, as described below.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 40-41 and 44-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doi et al. (US 5,527,647), in view of Tanaka et al. (US 2002/0022184) and either Hasegawa et al. (US 6,677,107) or Itoh (US 2003/0184721), further in view of either Dove et al. (US 5,939,225) or Mitsui et al. (US 6,242,138), and further in view of Chen (US 6,274,281).

Doi et al. teach a phase shifting mask (PSM) having a thinned halftone or attenuating PS (attPS) layer and a method of manufacturing it (title, abstract). Such an attPS is contemplated for improving photolithographic resolution to increase miniaturization of circuit patterns to manufacture a semiconductor device (col. 1 lines 13-19). In the method of manufacturing the attPSM, the attPS layer is reduced in thickness from an initial thickness 20 to a first thickness 19 by dry etching (of which reactive ion etching (RIE) is a known type, col. 1 lines 44-45, *instant claims 48-49*) or wet etching to transmit the desired amount of exposure light (e.g., T = 5% to 15%, etc., at the desired wavelength of exposure light, *instant claims 45-47*) and patterned by selective dry etching (RIE is a known type, *instant claim 50*) or wet etching of grooves or trenches 15 through the attPS layer into the transparent substrate 11 at 16, as shown in Figure 3I (col. 4 lines 26-29, 39-49). The PS obtained for various embodiments is 180° (e.g., col. 4 line 61, etc., *instant claim 44*).

Doi et al. do not specifically teach: ***[1]*** that the initial thickness of the attPS layer before thinning would be suitable for a first wavelength and that the thinning would make it suitable for a second wavelength that is shorter than the first wavelength; ***[2]*** that a part of the attPS layer with a second thickness remains at the clear areas of the attenuated PSM, wherein the second thickness is less than the previous first thickness of this layer; nor ***[3]*** that the initial thickness attPS layer is on a mask blank prefabricated by a first company, which is different from a second company manufacturing the attPSM from the prefabricated mask blank.

However, it is a known and even a common practice for a prefabricated mask blank and the resulting patterned mask to be made or fabricated by different companies or manufacturers, as taught by either Hasegawa et al. (col. 25 lines 1-11) or Itoh ([0046]).

Furthermore, Tanaka et al. teach several exemplary types of business and management transactions (e.g., to obtain profits while advancing the saving of environmental resources, etc.) between a first company that prepares or remanufactures and then supplies prefabricated mask blanks according to their quality or grade for use with a suitable (first) exposure wavelength and a different second company that then uses the supplied prefabricated mask blanks to make or manufacture patterned masks (e.g., the patterned masks are further used for making integrated circuits or other patterned devices by either the second company or yet another different (third) company, etc. [0327]-[0339] ***[3]***). The cost of prefabricated mask blanks designed or adapted for use with shorter exposure wavelengths, such as 193nm or even 157nm, are more expensive than those adapted for use with longer exposure wavelengths [0004]. Normal mask blank remanufacturing is known to include thinning of the mask blank [0007]. Also, it is described that a "shade film" or dark film region on a mask or mask blank generally has a transmittance (T)

of $\leq 40\%$ for the exposure light (at a target wavelength), whereas a "transparent" or clear region on a patterned mask has $T \geq 60\%$ [0209]. The target exposure wavelengths alternatively include 248nm, 193nm, or 157nm [0224] and the shading or absorbing materials include resist, metals, metal nitrides, or metal silicides [0226].

Also, it has been known for some time that an attPS layer at a first thickness that is suitable for a desired transmittance (e.g., T = 5% to 15%, etc.) at a first wavelength could be made suitable for the same desired transmittance at a second wavelength that is shorter than the first wavelength by simply reducing the thickness of the attPS layer, as taught by Dove et al. (Figures 6, 8, and 10, col. 4 lines 29-49, col. 5 lines 7-11). Figure 6 shows transmittance (T, %) of an attPS layer material (SiC-N) as a function of wavelength (λ, nm) for thicknesses (D) of 50nm, 100nm, and 150nm. For this attPS layer material, ~10% T can be obtained at a first wavelength (λ_0) of about 280nm for a first thickness (D_0) of 150nm, while ~10% T can also be obtained for this same attPS layer material at a second wavelength (λ_t) of about 200nm for a second thickness (D_1) of 50nm (reading on *instant claim 41* for $\lambda_0 - \lambda_t \geq 30$nm). Figure 8 shows a similar relationship of ($MoSi_2$-O_2) attPS layer material T (%) as a function of λ (nm) for D of 175nm, 225nm, and 250nm. For this attPS layer material, ~5% T would be achieved at λ_0 of ~255nm for D_0 = 250nm, while ~5% T would also be achieved at λ_t of ~230nm for D_1 = 175nm. Figure 10 shows that for a MoO_3 attPS material, ~20% T would be observed for D_0 = 200nm at λ_0 of ~370nm, while ~20% T would also be observed for D_1 = 25nm at λ_t of ~250nm (reading on *instant claim 41* for $\lambda_0 - \lambda_t \geq 30$nm).

Alternatively, Mitsui et al. teach a halftone (attenuated) phase shift mask (attPSM), a method of manufacturing an attPSM, and an attPSM blank therefore (title, abstract, col. 1 lines

11-19). This attPSM satisfies various optical characteristics (e.g., light (optical) transmission, amount of phase shift (PS), etc.) with high precision, as well as reducing defects in the thin film of a light translucent or semi-transparent portion (abstract, col. 1 lines 45-56), which is understood to mean an attPS layer 3a formed over a transparent substrate layer 1 (as shown in Figure 2, col. 7 lines 8-10). A typical conventional halftone (attenuated) PSM has a transparent substrate 1, a clear light transmitting portion 2, and an attenuating PS (attPS) portion 3, which is shown by Figure 1(a) and described at col. 1 lines 57-66. The transparent substrate is made of clear material (e.g., quartz, etc., col. 5 line 65) and the light (optical) transmission T of the attPS layer to the exposure light is preferably about 2% to 20% (col. 5 lines 15-17). A lower optical transmission T is preferable for line and space patterns, while a higher optical transmission T is preferable for hole system patterns (col. 5 lines 21-24). Figure 6 shows a graph for the dependency of light (optical) transmission (T, %) as a function of the wavelength (λ) of exposure light (e.g., T = 5% at λ = 248nm, T = 19% at λ = 365nm, T = 40% at λ = 488nm, etc., col. 8 lines 13-25) through an attPSM blank having a constant thickness (e.g., 931 Angstroms (Å), etc.) of a MoSiON attPS layer for a PS = 181° (Figure 5, col. 8 lines 10-13). Figure 5 also shows that for the same exposure wavelength (λ = 248nm) and nearly the same or slightly smaller PS (180°), increasing the thickness of the MoSiON attPS layer from 931 Å (93.1nm) to 1378 Å (137.8nm, Comparative Example No. 1) decreases the transmission (T) of exposure light from 5% to 2%, respectively (col. 8 lines 26-44). Thus, (optical) transmission T decreases with decreasing wavelength λ, but T increases with decreasing thickness of the attPS layer, and the amount of PS is nearly the same (approximately equal) or increases with decreasing thickness of the attPS layer. The method of manufacturing or fabricating the attPSM from an attPSM blank (e.g.,

having a MoSiON attPS layer, etc.) involves patterning a resist on the attPS layer of the attPSM blank, then removing portions of the attPS layer through the resist pattern by etching (e.g., using dry etching with a gas including CF_4, etc., col. 9 lines 18-25 and col. 10 lines 3-8 and 22-28).

It is also known to make an attenuated phase shift mask (attPSM) having a part of the attPS layer with a second thickness remaining at the 0° (clear) areas between densely spaced lines or features of the attPSM, in which the second thickness is less than the previous first thickness of this layer (as taught by Chen, abstract). Chen describes an attPSM made by coating a resist 60 on a mask blank having a PS material 45 on light absorbing semi-transparent (attenuating) layer 43 (with a first thickness 49 for a first transmittance of about 4% to 20%) on a transparent substrate 40 (as shown by Figure 4), patterning the resist 60 (e.g., by electron beam, etc., as shown in Figure 5), then etching through the resist to only partially etch through and reduce the thickness of the attenuating layer 43 (at positions 46, down to a second thickness for a second transmittance of about 90% to 99%, which are relatively clear areas) between densely spaced features 44 (Figure 6, col. 4 line 28 to col. 5 line 14). The reduced thickness of attPS material 43 at positions 46 between densely spaced features 44 provides improved image quality, while avoiding the necessity of an optical proximity correction (OPC) method (col. 5 lines 14-19).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention in the method of manufacturing the attPSM that includes thinning an attPS layer from an initial or default thickness (D_0) to a first (adjusted) thickness ($D_1 < D_0$) before patterning clear areas in the attPS layer (as taught by Doi et al.) in order to make an attPSM blank designed or adapted for a first predetermined PS and (optical) transmission (T_0) at a first wavelength (λ_0) of

exposure light suitable for a second shorter target wavelength (λ_t) by thinning the attPS layer (as taught or suggested by Dove et al. or Mitsui et al., *[1]*). In the method of manufacturing the attPSM taught by Doi et al. and either Dove et al. or Mitsui et al., it would also have been obvious to remove only a portion of the attPS material having a first thickness at clear areas of the attPSM so that a part of the attPS layer with a second thickness remains at the clear areas of the attPSM, wherein the second thickness is less than the previous first thickness of this layer. This is at least because the remaining reduced thickness of the attPS layer at the clear areas between closely spaced features provides improved image quality, while avoiding the necessity of an optical proximity correction (OPC) method (as described by Chen, *[2]*). Furthermore, in the method of manufacturing the attPSM taught by Doi et al., either Dove et al. or Mitsui et al., and Chen, it would have been obvious for a first company to prefabricate the attPSM blank designed for a first predetermined PS and (optical) transmission (T_0) at a first wavelength (λ_0) of exposure light, then for a different second company to make or adapt this prefabricated attPSM blank suitable for a second shorter target wavelength (λ_t) by thinning the attPS layer before patterning the adapted attPSM blank to make an attPSM suitable for the second shorter wavelength (λ_t), because it is a known and even a common practice (as taught by Hasegawa et al. or Itoh, and Tanaka et al.) for a first company to make and supply a prefabricated mask blank (such as an attPSM blank), which a different second company obtains from the first company and then uses to make a patterned mask (such as an attPSM). Additional motivation for this combination is derived from Tanaka et al., because the cost of a prefabricated mask blank designed for use with a longer exposure wavelength (e.g., 193nm, etc.) is less than the cost of a prefabricated mask blank designed for use with a shorter exposure wavelength (e.g., 157nm,

etc.), while normal mask blank remanufacturing is known to include thinning of the mask blank *[3]*.

Claims 42-43 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doi et al. (US 5,527,647), in view of Tanaka et al. (US 2002/0022184) and either Hasegawa et al. (US 6,677,107) or Itoh (US 2003/0184721), further in view of either Dove et al. (US 5,939,225) or Mitsui et al. (US 6,242,138), further in view of Chen (US 6,274,281), and further in view of Jin et al. (US 6,524,755).

While teaching various aspects of the instant claims, Doi et al., Tanaka et al. and either Hasegawa et al. or Itoh, Dove et al. or Mitsui et al., and Chen do not specifically teach the instant equations for determining phase shift and transmittance at first and second thicknesses of the attPS layer before reducing initial thickness of the attPS layer to a first thickness and patterned etching of the attPS layer to a second thickness (as recited by *instant claims 42-43 and 53*).

However, these equations are known relationships, as taught by Jin et al. Jin et al. teach methods of making attPSMs having desired optical transmission (T) and PS function (attPS) at various wavelengths achieved by controlling optical properties and thickness of constituent film layers (title, abstract). Figure 12G shows T=5% to 15% through (dark) attPS layer(s) versus T=100% for etched clear areas through a substrate. The desired or predetermined transmission is given by:

$(T_{1,2}) = T_0\exp[-4\pi k_t D_{1,3}/\lambda_t]$, where $T_{1,2}$ represents either a first transmission T_1 at a first thickness D_1 or a second transmission T_2 at a second thickness D_3, T_0 is a constant initial value for T through the attPS layer at an initial thickness D_0, (which appears to be analogous to the instant A_t), k_t is the complex part of the refractive index of the attPS layer (which is an optical

property believed to be equivalent to the instant extinction coefficient), and λ_t is the desired or predetermined wavelength of exposure light. The total phase delay through a multilayer structure, such as an attPSM, is given by:

$\Phi_{total} = \Phi_{1,2} + \Phi_S = [(n_1-1)D_{1,3} + (n_2-1)D_S]2\pi/\lambda_t$, where, Φ_t represents the total PS through plural layers ($\Phi_{1,2}$ is either a first PS at a first thickness D_1 or a second PS at a second thickness D_3 and Φ_S is the PS for the substrate having a thickness D_S), n_1 and n_2 represent refraction indices for the layers, π radians is equivalent to 180°, and λ_t is the desired or predetermined wavelength of exposure light (col. 8 line 63 to col. 9 line 19, with adaptations made to simplify comparison with the instant claims). Since the transparent substrate has the same thickness and optical properties under both the clear etched areas at a second thickness of the attPS layer and the dark areas at a first thickness of the attPS layer, the expression for the total phase delay **difference** (in degrees rather than radians) between the clear and dark areas ($\Phi_t = \Phi_1 - \Phi_2$) can be simplified and rearranged to that for a single attPS layer (having $n_1=n_t$ at λ_t) patterned by etching, which is given by:

$\Phi_t = \Phi_1 - \Phi_2 = [2(n_1-1)(D_1 - D_3)/\lambda_t]180°$ (which reads on *instant claim 42*). Figure 13F shows gradual thinning of an attPS layer 137, which is then followed by another etching step to etch further (e.g., into the substrate, etc.) to achieve a 180° phase shift depth, as shown in Figure 13G (col. 15 lines 30-37).

It would have been obvious to one of ordinary skill in the art at the time of the invention in the method of making the attPSM taught by Doi et al., Tanaka et al. and either Hasegawa et al. or Itoh, Dove et al. or Mitsui et al., and Chen to use the instant equations for determining phase shift difference between clear and dark areas of the attPSM and transmittance at first and second

thicknesses of the attPS layer at the target or predetermined second wavelength before reducing initial thickness of the attPS layer to a first thickness and patterned etching of the attPS layer to a second thickness (as taught by Jin et al.), in order to prevent overetching and plan or predetermine the desired extent of reduction in thickness (thinning) of the attPS layer from the initial thickness to the first thickness, and then further selective reduction in thickness by patterned etching to achieve the desired PS difference between dark and clear areas (preferably close to 180°) of the attPS layer, while also ensuring the predetermined amount of transmittance (e.g., T of about 5% to 20%, etc.) at the target or predetermined second wavelength. This is at least because Jin et al. teach that such equations for transmittance and PS through an attPSM are known (reading on *instant claims 42 and 53*). It would also have been obvious to reduce the thickness of the attPS layer from the initial thickness to a first thickness before further patterned etching to a second thickness (e.g., as shown by Jin et al.), because this would reasonably be expected to carefully control the PS difference (e.g., 180°, etc.) between the first and second thicknesses of the attPS layer (*instant claim 43*).

Response to Arguments

Applicant's arguments with respect to claims 40-50 and 53 have been considered but are moot in view of the new ground(s) of rejection set forth above, which have been necessitated by Applicant's currently entered amendment.

Conclusion

The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure. Smith (US 2003/0077520) teaches either the same or at least similar attPS materials

for an attPSM ([0019]-[0020], [0052]-[0053]) to those listed in the instant specification at [0030] lines 5-6.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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